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AMPHICARPY IN EAST AFRICAN CYPERACEAE

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Amphicarpy, as defined by ZOHARY (1937), HYLANDER (1946) and others, is the production of two kinds of fruit, one above ground for general distribution, the other at ground level or below and not usually distributed far from the parental station. In preparing drawings for a proposed book on the sedges of Uganda Dr. LYE and I have met with a few East African examples, some already well known and some new.

In *Bulbostylis humilis* KUNTH (Fig. 1), as noted by CLARKE (1898) in South Africa, many collections show, besides the aerial inflorescences of 1—3 spikelets carried on culms, solitary spikelets in the axils of the leaves at ground level. The glumes and styles of the basal flowers are longer than those of the aerial, but the fruits are similar.

In *Bulbostylis glaberrima* KÜK. (Fig. 2) there may be no basal fruits, as in HEDBERG's No. 4545 from Mt. Elgon. But HAMILTON 233, forming a short turf on a rock surface of the same mountain and at about the same altitude,

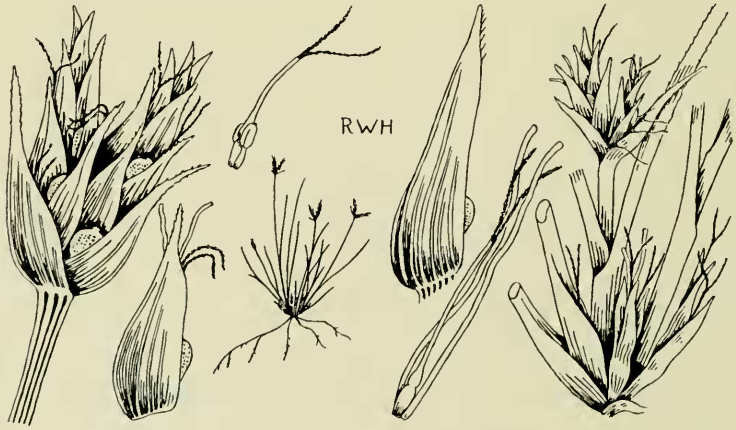
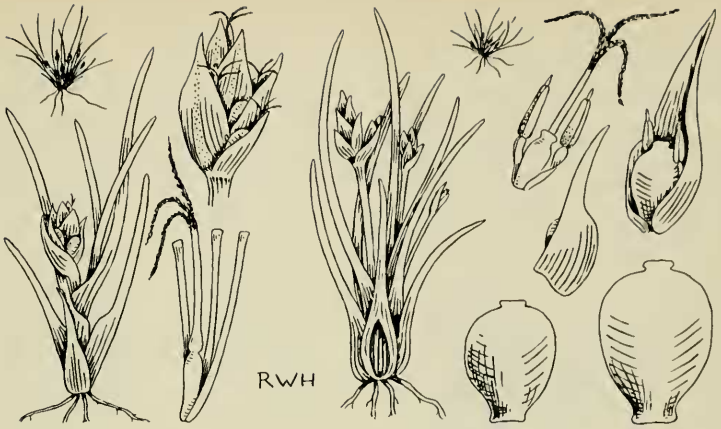
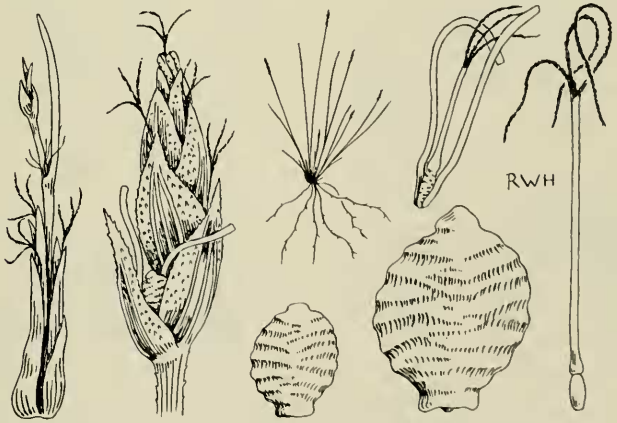


Fig. 1. *Bulbostylis humilis* KUNTH. From left to right and above downwards : Aerial inflorescence, aerial glume and fruit, aerial flower, whole plant X 2/5, basal glume and fruit, basal flower, plant fragment with aerial and basal flowers. NEWBOULD 5855, Malenda Crater Highlands, Tanzania.



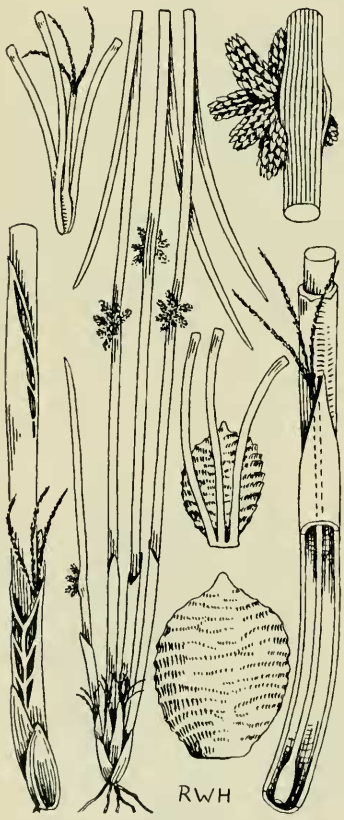
2. *Bulbostylis glaberrina* Kük. Left, with no basal flowers. Whole plant X²/₅, fragment, fruiting inflorescence, flower. Hedberg 4543, rocky outcrop on Western slope of Mt. Elgon, Uganda. Right, with basal flower. Fragment with aerial and basal inflorescences, whole plant X²/₅, aerial flower, aerial bract, basal bract and fruit, aerial and basal fruits. Hamilton 233, Mt. Elgon crater, Kenya.

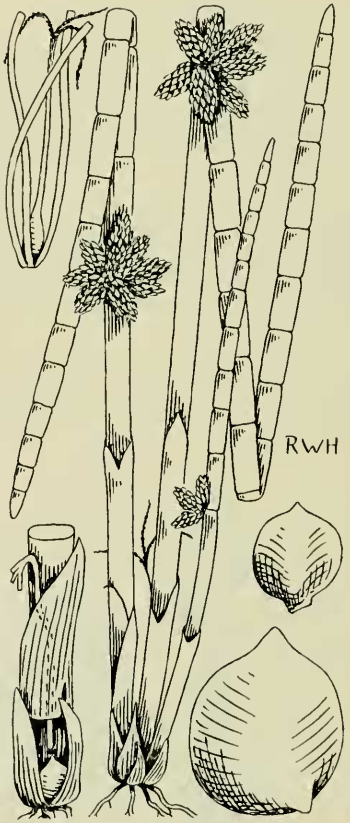


3. *Bulbostylis* sp. Basal and aerial inflorescences, aerial inflorescence in fruit, whole plant X²/₅, aerial and basal fruits, aerial and basal flowers. Wingfield 392, 1,600 m, Tanzania.

3500 m, has solitary basal flowers with aborted stamens in the axils of the leaves. The basal fruits are larger than the aerial and bulge the leaf sheaths which hold them in place.

In WINGFIELD 392 (Fig. 3) a Tanzanian *Bulbostylis* difficult to match with any known East African species, the habit resembles that of *B. humilis* with 1—3 flowered spikelets at the base, but the basal flowers have no stamens and the fruits are much larger than the aerial. This difference in size is highly developed in the amphicarpous species of *Scirpus*, all placed by CLARKE (1908) in his group Mucronatae.





4. *Scirpus lateriflorus* GMELIN: Aerial flower, culm base with scales and protruding style branches, whole plant X²/₅, aerial inflorescence, aerial and basal fruits, basal flower exposed. LOCK 69/401, Queen Elizabeth Park, Uganda.

5. *Scirpus articulatus* L.: Aerial flower, basal fruits and style, whole plant X²/₅, aerial and basal fruits. LOCK 579, Queen Elizabeth Park, Uganda.

In *Scirpus lateriflorus* Gmelin (Fig. 4), sometimes considered a variety of *S. supinus* L., as noted by Kern (1958) and Koyama (1958), long style branches may protrude from the sheaths, the stem of the style lying in a groove of the next succeeding sheath and arising from a solitary ovary in the axil of the enclosing sheath, with no associated glume or stamens. This forms a large fruit marked by transverse ridges like the aerial fruit, but less strongly. Jackson (1882) says that basal flowers were "noticed by Dr. Asa Gray in *Scirpus supinus* L., a small form of which in the Kew herbarium from S. Africa shows them plainly". Probably the sheet referred to was Drege 7414 collected in 1840 at Ebenezer, by the Olifants River, and Jackson's note represents the first record of amphicarpy in Cyperaceae.

Scirpus articulatus L. (Fig. 5) again shows the large rounded basal fruits, and styles or fruits can be seen in Kenyan (Gillespi 305) and Tanzanian (Greenway 3992, Semsei 2922) collections in Kew. So do *S. praelongatus* Poir. and *S. muricinux* C. B. Clarke. Chermezon (1929 and 1937) has described and figured *S. aberrans* and *S. reductus* from Madagascar with solitary basicaulous flowers as in our species, also *S. perrieri* which parallels *Bulbostylis humilis* in its many flowered basal spikelets.

Several questions arise. Are all amphicarpous plants annuals, though some, such as *Scirpus articulatus,* have been considered perennial? What factors encourage the development of basal fruits? Dr. Lock finds in the Queen Elizabeth Park that dwarfed plants growing on drier ground show them most often, while in more luxuriant forms in damper places they may not occur. The mud around elephant foot-prints may be forced up into ridges which soon dry out, giving the dwarf amphicarpous growth.

Finally how has amphicarpy evolved? Several Cyperaceae have intermediate emergency buds between the lowermost shoots that form new culms and the uppermost that form the inflorescence. These buds normally abort, but may form flowers if the main inflorescence is destroyed. Possibly it is these that have become specialised to give the basicaulous flowers.

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